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ACUTA

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This Issue: Mobile Integration

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Event	Date	Location
Annual Conference	April 18–21, 2010	JW Marriott San Antonio Hill Country San Antonio, Texas
Summer Seminar	July 18–21, 2010	The Palace Hotel San Francisco, California
Fall Seminar	October 24–27, 2010	Sheraton Premier at Tyson's Corner Metro DC
Winter Seminar	January 9–12, 2011	Pointe Hilton at Tapatio Cliffs Phoenix, Arizona

ACUTA's Core Purpose is to support higher education information communications technology professionals in contributing to the achievement of the strategic mission of their institutions.

ACUTA's Core Values are:

- Encouraging and facilitating networking and the sharing of resources
- Exhibiting respect for the expression of individual opinions and solutions
- Fulfilling a commitment to professional development and growth
- Advocating the strategic value of information communications technologies in higher education
- Encouraging volunteerism and individual contribution of members

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Contents

Spring • Volume 14 Number 1
Mobile Integration

FEATURES

Dixon Design

INTERVIEW

COLUMNS

ADVERTISERS' INDEX

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Keeping the control of this evolving technology close at hand is critical to being able to integrate with other in-house collaboration and location-based services, from calendaring to course/learning management to integrated security to RFID to simulations and virtual worlds to social networking.

Mark Katsouros, University of Iowa
page 26

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PRESIDENT'S MESSAGE

HARVEY "BUCK" BUCHANAN
FLORIDA STATE UNIVERSITY
ACUTA PRESIDENT
2009–2010

Getting Ready for 2010–2011

I find myself amazed at how fast this year is going by. ACUTA has had a lot of success this year, and we are excited about what our new committees are accomplishing. I am continually amazed at the talent and dedication of our volunteers—which reminds me that it is time once again to start thinking about next year.

By the time you read this message, ACUTA will have elected a new board of directors. Because the outcome of that election is unknown as I write this, I will take this opportunity to say thanks to each individual on our slate of nominees:

- **Joseph E. Harrington**, director, network services, Boston College
- **Richard W. Besch**, director, Applications/Systems Technology Support Group, and project manager, Banner/Luminis Systems, Texas A&M Corpus Christi
- **Matthew V. Fuoco**, director, telecommunications and networking, University of Kansas Medical Center
- **Walt Magnussen**, director for telecommunications, Texas A&M University
- **Mark Reynolds**, interim director, ITS CNS, BICSI RCDD, University of New Mexico.

The ACUTA board for 2010–2011 will be presented at the close of the Annual Conference in San Antonio.

We also want you to start thinking about your involvement opportunities for next year. Over the course of this year, we have tried to keep you informed about our committee restructuring and its progress (see 1/4/2010 blog posting by Ron Kovac at http://www.acuta.org/?2672). Last year—with the introduction of the Mentoring/Career Development Subcommittee, the Social Networking, New Media, and Web Resources Subcommittee, and the Young Professionals Subcommittee—we brought on board 20 new volunteers. ACUTA is an organization that not only appreciates our members but also recognizes that our effectiveness is achieved only because of the quality and willingness of our volunteers. This is your organization.

This year we will continue the rework of our committee structure. Listed below are committees that will be created and/or modified and their anticipated duties.

ACUTA Ambassador Task Force

- Perform membership recruitment and retention functions as requested by ACUTA board or staff
- Conduct outreach to current and potential members and other organizations
- Interface with the Young Professionals Subcommittee for the purpose of mentoring those who have been in the field for less than 10 years

Event Development Subcommittee

Responsible for special projects as assigned by the program/content chair, such as development of summits, onetime and periodic programs.

Online Learning and Communities Subcommittee

- Recommend and oversee online learning programs
- Research best practices for alternative educational offerings

- Identify topics and presentations that could be offered in alternative formats
- Assist the ACUTA staff in conducting online learning programs
- Advise all ACUTA committees regarding ways in which online learning can be offered by ACUTA

Environmental Scanning Committee

- Monitor and report on publications in the fields of ICT and education
- Analyze and report trends that are relevant to ACUTA members
- Advise and consult with the data analyst and focus group leader to provide focus and context for their work on behalf of ACUTA

Journal/Newsletter Subcommittee

- Set *Journal* content themes each year
- Establish and periodically revise editorial standards, and assist with recruitment of authors
- Conduct interviews, write articles, and otherwise participate in *Journal* development as requested
- Recommend format and content for the *ACUTA eNews* as requested

Publications Development Subcommittee

- Responsible for special publications projects such as books, wikis, and other new projects
- Assist the communications manager with special publications, including recruiting authors, writing, editing, and providing other assistance as needed

As I write this, we are preparing to add the new committees and subcommittees to the "Get Involved" section on ACUTA's website. I hope you will give this careful consideration, recognizing not just the time involvement (which varies from one committee to another) but also the opportunity to grow personally and professionally by taking on a new responsibility.

We believe that this structure will ensure our success in serving you. This expansion will increase your opportunity to become more active in shaping not only ACUTA but the community it serves. We ask that you seriously consider your opportunity to enhance the ACUTA organization.

Many of you serve in leadership roles in ACUTA. Many are active on the listserv. Some contribute articles to the *eNews* or the *Journal*, or give a presentation at one of our events. This is what makes ACUTA valuable to all of us. However you are involved, I sincerely thank all of you for your participation.

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From the Executive Director

Jeri A. Semer, CAE
ACUTA Executive Director

A Potpourri of Regulatory Concerns

Periodically, we receive questions about a few regulatory issues that recur over the years. I'd like to review some of the most frequently asked questions and provide some guidance to resources that can help if you require more information.

The Do-Not-Call Registry

Telemarketing calls continue to plague many campuses, and they seem to come in waves. Members in the United States frequently ask us how to add campus numbers to the Federal Trade Commission's Do-Not-Call (DNC) Registry, which is limited to residential numbers, including cell phones. When the law was first enacted, ACUTA secured an agreement with the FTC staff that allows student residence numbers to be included in the registry, even if they are technically business lines. However, the law doesn't allow the inclusion of lines used for administration. There is also no mechanism for entering large blocks of numbers. Individuals may enter up to three numbers at once, including cell phones. Once a number is registered, telemarketers have up to 31 days to remove it from their calling lists. Numbers remain on the DNC Registry until they are disconnected or purposely removed.

Keep in mind, the DNC law does not prevent calls from charities, political organizations, or surveys, or from companies you have done business with or given permission to call. More information on the DNC Registry is available at http://www.ftc.gov/bcp/edu/microsites/donotcall/index.html.

E911 for Multiline Telephone Systems

ACUTA encourages its institutional members to implement E911 service on their multiline telephone systems (MLTSs) for the safety of their campus communities. However, there is still no national requirement for E911 service for PBX, Centrex, or multiline VoIP phone systems. According to the National Emergency Number Association (NENA), 15 states had some form of E911 law for MLTSs as of July 30, 2009 (see http://www.nena.org/mlts-pbx/state-legislation). NENA continues to call upon the FCC and Congress to move toward enacting a national requirement, but it recognizes that such a requirement should not place an unreasonable burden on system manufacturers, providers, or operators of MLTSs.

VoIP providers that are interconnected to the PSTN are required to provide 911 service to individual consumers, although the services may have some limitations. For a detailed explanation of E911 for VoIP, see the FCC fact sheet at http://www.fcc.gov/cgb/consumerfacts/voip911.html. VoIP manufacturers continue to develop improved E911 systems for MLTSs, and we urge ACUTA members to consider this issue when transitioning phone service to VoIP.

E911 for Cellular Phones

All wireless carriers, broadband personal communications service licensees, and certain specialized mobile radio licensees are required to comply with the FCC's wireless 911 and E911 rules. By the end of a five-year phase-in period on September 11, 2012, all of the licensees must be fully compliant and provide specified location data to the nearest public safety answering point. For more details, check the FCC's wireless 911 fact sheet at http://www.fcc.gov/cgb/consumerfacts/wireless911srvc.html.

IRS and Cell Phones

Although there is pending legislation and the IRS commissioner has called for elimination of cell phones as "listed property," there have been no actual changes in the current requirements. Personal use of business-provided cell phones and similar devices remains a taxable employee benefit. Employer record-keeping requirements remain in force, although it is uncertain to what extent the IRS is currently enforcing these requirements. ACUTA and other organizations continue to press for legislation and/or regulatory relief of the unreasonable record-keeping regulations. For up-to-date information, check the ACUTA website at http://www.acuta.org/dynamic/legreg/legreg.cfm, under "Tax Issues."

As mobility becomes more pervasive on college and university campuses, we will continue to keep our members informed and work to create a favorable regulatory environment for the higher-education community. If there are issues you would like more information on, don't hesitate to contact me at jsemer@acuta.org. There is a network of ICT policy and regulatory experts on the Legislative/Regulatory Affairs Committee and in our legal counsel's office who are dedicated to meeting your needs.

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Thank You for Serving on an ACUTA Committee

A volunteer organization such as ACUTA depends heavily on its members for success. ACUTA members have a history of stepping forward to assume leadership responsibilities and participate in the important planning process and other programs. On this page ACUTA recognizes all those who have participated on committees this year. Your contributions have made ACUTA more effective, more efficient, and more valuable. Thank you to each person named here.

Savannah Armijo, Marywood Univ.: Young Professionals Subcomm.
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Debbie Ziolkowski, SS8 Networks: Corp. Liaison Committee

The Future of Fixed Mobile Convergence

Walt Magnussen, PhD
Texas A&M University

Every once in a while, a revolutionary new technology changes the way we communicate electronically. This was the case when visionaries at DEC, Xerox, and Intel invented Ethernet. It was repeated as the DARPA-funded researchers in California invented TCP/IP, and it was repeated yet again when Rosenberg, Schulzrinne, Sparks, and others wrote RFC3261, which gave us the session initiation protocol (SIP). All of these were intended to be enabling technologies that, if adopted by industry, had the capability of making significant world changes. In the end, they did change the world.

We are on the cusp of yet another potentially world-altering technology known as the IP multimedia subsystem, or IMS. Written by the industry standards body, 3GPP (3rd Generation Partnership Project), it is intended to move 4G cellular networks away from circuit-switched technology toward an all-IP-based communications system. The reason this has the potential to affect the way that we communicate is that IMS is based on SIP signaling and can use SIP proxies to integrate with customer networks. The impact that this could have on fixed–mobile convergence (FMC) is staggering. In the past, the carriers' networks were all based on SS7 signaling, while our networks were either TDM, SIP, or a variation of H.323. This made integrating services and applications next to impossible.

With the inception of SIP in 2002, the world was introduced to a new signaling protocol that not only supported voice but was designed to be a multimedia protocol that could support video and other real-time applications as well.

At first, this was considered to be only a toy for a few leading-edge communications providers that mostly operated in the open-source space. At the time, due to lack of feature support for enterprise systems, Cisco, Nortel, Avaya, Mitel, and all the rest of the field adopted customized versions of the ITU-T H.323 standards. Surprisingly, enough of the first major commercial deployments of SIP were with the long-distance carriers such as AT&T, Verizon, MCI, Sprint, Qwest, and others. As we decided which way we were going to go, they silently converted their SONET-based TDM backbones to SIP running over separately provisioned IP backbones.

The next to get on board with SIP were the VoIP service providers such as Vonage, AT&T's U-verse, Comcast's voice network, and others that wanted to make voice a part of a triple-play service offering (voice, data, and video). The last to jump on the band wagon were the enterprise telephone switch providers listed above that had initially decided to use customized versions of H.323. They had now all decided to either convert their entire switching fabric to utilize SIP signaling or at least provide SIP functionality at the edge of their networks allowing seamless SIP integration. This left just the cellular network providers to join in if we were going to have true FMC.

FMC and the IMS Architecture

What is meant by fixed–mobile convergence? You can probably come up with as many definitions as there are people. Webster's *New World Telecom Dictionary* (edited by Ray Horak) says FMC is "[a] term coined by the 3GPP for the seamless melding of fixed IP-based fixed wireless and cellular radio networks." A practical explanation is the ability to access every application as easily on your mobile device as it can be accessed on your desktop. It also means that you can, if you wish, have one telephone number and one unified messaging voice mailbox for both your mobile and fixed computing devices.

The question then becomes, how can IMS make this new world of FMC a reality? The answer can easily be seen if you look at the IMS architecture.

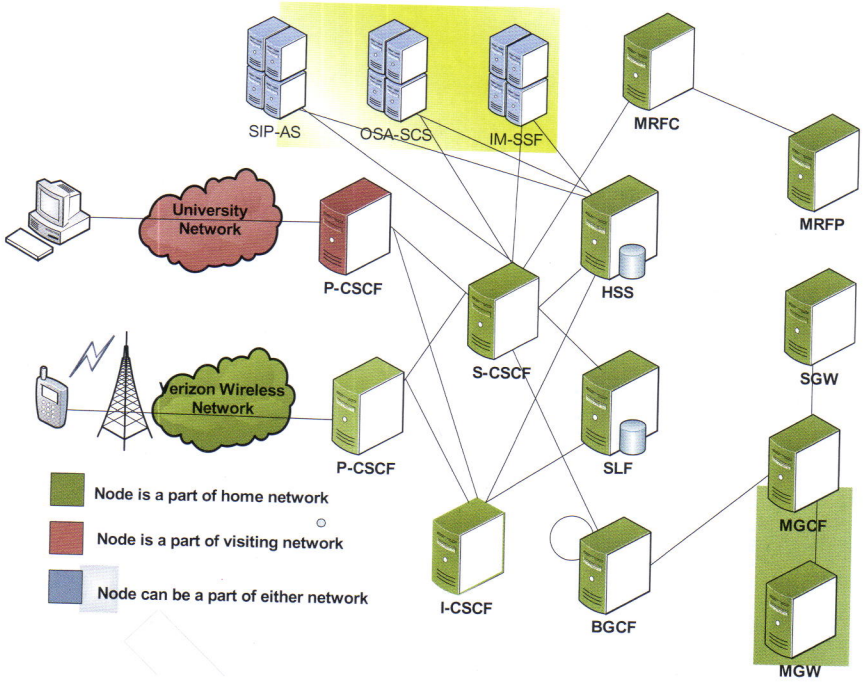
IMS, just like all other cellular networks, is based on the concept of a home network and a visiting network. In the past, the home network was typically the cellular carrier with whom you contracted, and the visiting network was the cellular network that you used when you roamed. The first change that IMS introduces is that now the visiting network can be a university or other enterprise customer's network. This is a very significant change.

In Figure 1, the network nodes in green are defined by the 3GPP to be functions of the home network (although a few of them can be supported by either the home or the visiting network). The nodes in red are functions provided by the visiting network. The blue nodes can be provided by either or both the home and the visiting networks. While this diagram shows the Verizon Wireless network, it is understood that it can be any wireless carrier.

The following briefly defines the purpose of the IMS nodes shown in the diagram:

- CSCFs. All SIP proxies that perform registration, authentication, forwarding, et cetera.
- BGCF, MGW, SGW, and MGCF. Gateways (both signaling and media) and gateway control functions that connect the IMS network to the PSTN.
- SLF and HSS. Devices that track IP addresses as a user moves around the Internet and provides the location information of the user (currently the home location record, or HLR, in current cellular networks).
- MRFC and MRFP. Devices that play messages for busy tone, redirects, music on hold, or any other information that the network needs to provide. The MRFP is the server that hosts the media and is defined by the 3GPP to be a part of either the home or the visiting network. This could mean that we could customize our messages even on the carriers' networks going forward.

Figure 1. Interaction between home network and visiting network



Glossary

P-CSCF: Proxy Call/Session Control Function. This is the first proxy between the IMS terminal and the IMS network.

I-CSCF: Interrogating Call/Session Control Function. This proxy queries the location system and provides redirect information.

S-CSCF: Serving Call/Session Control Function. This is the core SIP proxy. It serves as both the SIP server and the SIP registrar.

SIP-AS: Sip application server

OSA-SCS: Open Service Access-Service Capability Server. Provides an interface to OSA application servers (used in most 2G and 3G networks).

IM-SFF IP: Multimedia Service Switching Function. Allows the reuse of CAMEL applications (developed for GSM networks).

MRFC: Media Resource Function Controller. Directs caller to appropriate media resource such as music on hold, custom ring tones, et cetera.

MRFP: Media Resource Function Processor. Holds the media for music on hold, custom ring tones, et cetera.

BGCF: Border Gateway Control Function. Directs calls destined for outside of the IMS network to the appropriate gateway.

MGCF: Media Gateway Control Function. Associates call media with call signaling.

SGW: Signaling Gateway. Converts SIP signaling to SS7 TDM signaling.

MGW: Media Gateway. Converts RTP IP media to TDM media.

HSS: Home Subscriber Server. The IMS replacement for the existing home location registrar (HLR) and visiting location registrar (VLR) that track current locations of IMS terminals (phones).

SLF: Subscription Location Function. Maps current location in the HSS to the current IP address.

- SIP-AS, OSA-SCS, and IM-SSF. Application servers that can and will be a part of either network. Examples of carriers' applications include such things as the navigation tools that direct us to a certain location. Applications provided by the university include such things as course management systems, such as Blackboard and Moodle, and presence servers that update the HSS with our campus presence status.

The IMS architecture was designed to provide three capabilities that we do not have today. The first capability is to be able to pass billing information between the home and visiting networks. This could mean more real-time ability to track and manage costs. The second ability is to authenticate users across the two networks. Using this, university applications would not even be visible to users if they did not have the appropriate credentials. The third ability is to be able to mark priority traffic for delivery to a separate queue for applications that have certain minimum quality-of-service requirements.

So where are the carriers on delivery of this new, powerful architecture? Both Verizon and AT&T Wireless are testing IMS in their labs. Rollout of their 4G networks is expected to begin in late 2010 or early 2011. It appears at this time that the Verizon and AT&T networks will run IMS over their LTE (long-term evolution) RF infrastructure. While it appears that Sprint (or at least its sister company CLEAR) will use WiMAX for its RF network, it does appear that IMS will manage their signaling and control plane.

How Do We Get Ready for IMS?

What does this mean to universities, and what can we do to get ready for it? Steps that we can take now that will allow us to get there quicker include the following:

1. Enable SIP on your campus network. This can be accomplished either by running native SIP, providing SIP capabilities at the edge of your VoIP network, or installing SIP gateways into your TDM voice network.

2. Install a distributed antenna system (DAS) either by doing it yourself, through a carrier, or with a vendor-neutral third party. DASs greatly reduce the cost to the carrier of installing a 4G overlay network on your campus.

3. Start to consider applications that can be SIP enabled that could later use IMS capabilities.

4. Communicate with your wireless service providers to find out the status of IMS and 4G in your community.

The other revolutionary technologies all proved to significantly change the way in which we communicate. The 3GPP's IMS architecture once again has made possible another leap forward in the area of FMC. Whether or not this happens is up to us and how we choose to implement the architecture.

Walt Magnussen, PhD, is director of telecom at Texas A&M University and a past president of ACUTA. He also chairs the VoIP and IPTV special interest groups and directs the Internet2 Technology Evaluation Center which is the VoIP lab for Internet2 at TAMU. Reach Walt at wmagnussen@mail.telecom.tamu.edu.

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Technology Forecast for Ohio: Cloudy with Lingering Savings

Curt Harler
Contributing Editor

The big cloud in Ohio's IT forecast isn't dark and ominous, but it could rain down some savings for higher ed. Cloud computing is about to change the technology environment.

In February 2009, Ohio Board of Regents chancellor Eric D. Fingerhut put together a committee of higher education institutions in Ohio and charged the team with spreading best practices throughout the state. The goal was to create efficiencies across all the state's campuses.

One of the technology answers they found is cloud computing for organizing and simplifying e-mail delivery. At a campus like the Ohio State University's, it is not unusual to find a dozen or more separate e-mail systems—each with its own costs and infrastructure.

Now, just about every educational institution in the state, from kindergarten to college, can voluntarily buy into a single system at substantial savings to the local administration.

In October, an agreement was reached between the University System of Ohio's technology infrastructure and operations arm, called OARnet, and Microsoft Corporation. The idea is to leverage the University System's group-purchasing power to bring additional messaging solutions to Ohio's educational system. OARnet executed the deal with eTech Ohio doing the systems evaluation. Known as the Education Alliance Agreement, it is a move toward a cloud-based approach to messaging, including purchases of Microsoft's Exchange Online, an e-mail, calendar, contact, and task service; the Live@edu collaboration and communications service; Office Web Apps, a lightweight version of the company's Office applications; and Microsoft Consulting Services and Microsoft Premier Support Services through a statewide master services agreement.

"You are looking at a shared infrastructure to run your own private cloud out of the university system," explains Matt Howard, CIO for the eTech Ohio Commission. Along with the Board of Regents, OARnet, and numerous other agencies, it coordinates technology in Ohio schools. In addition to 14 colleges and 29 junior college systems, there are 700 school districts with public and charter schools (not parochial schools), serving about 1.2 million students and 120,000 teachers.

"E-mail is a mission-critical system, a critical tool," Howard says. "If you find a vendor who is going to provide you what you require at the necessary service level, you have to ask yourself whether the value to your organization is providing the service or just having it available," he says. For many Ohio colleges, the answer is having reliable service available at a good price. But many organizations bristle if a system is mandated. So, a key component to the Ohio concept is that participation is voluntary.

When the state of Ohio increased its funding for schools, the institutions responded with commitments to find ways to stretch these dollars as far as possible, says Rob Evans, spokesperson for the Ohio Board of Regents. "Our role at the state is to

identify more areas where schools can share resources and cut costs," Evans says. He says the savings available to individual schools can be in the area of $10,000 or more.

"One of the chancellor's prime focuses is cost savings," Evans says.

"With the coming of virtualization, the physical location is no longer relevant," Howard continues. Having a 10 GB fiber backbone linking the corners of the Buckeye State helps. "Where the system lives becomes irrelevant," he adds.

Howard notes that it is a "compelling solution" offering schools lower total cost of ownership with greater flexibility and availability. The bigger the volume, the better the savings. "You don't need to make a large cash outlay to take advantage of the benefits," he says.

A Look at Clouds

Cloud computing is nothing new in technology. Cloud computing provides scalable, on-demand resources—usually over the Internet, or "cloud"—and does not require much user management or involvement in such areas as software updates or troubleshooting.

If you remember the "software as a service" (SaaS) concept, you have a pretty good handle on the basics of cloud computing. Users simply access the software they require on a pay-as-you-go basis.

The National Institute of Standards and Technology (NIST), never one to take the simple route, defines cloud computing as "a computing capability that provides an abstraction between the computing resource and its underlying technical architecture (e.g., servers, storage, networks), enabling convenient, on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction."

Let's stick with the idea of software-over-the-Internet.

The current Ohio deal is limited to e-mail and related services. However, OARnet earlier inked a similar deal with VMware (www.vmware.com) to buy licenses for its ESX server virtualization product at a significant discount.

Another successful mass-buying program has been making standardized purchasing cards available to all public universities for buying human resources technology, Evans says. One provider, JPMorgan, gives the cards to all of the colleges.

SLAs and Backup

One of the key components, Howard says, is backup. However, the one line on a contract Howard would check and double-check is the service-level agreement (SLA) and how it will be enforced.

The current deal offers "four-nines" uptime. "It's one thing to know the machine is on. But you need to know whether you are getting latency. Is the system responding? A blinking cursor doesn't cut it," Howard says.

On the larger scale, it is important that the whole system works, too. "A compelling point of this deal is that, if they lose a data center, they guarantee an equivalent center will be up within 24 hours…not just a server but a data center," Howard says.

"Be sure you monitor to ensure that you are getting what you pay for," Howard continues.

Once a college virtualizes, all sorts of services, including disaster recovery, are in play for cloud application.

"You have a lot of options. You can use the Amazon cloud or any other cloud. You can shop for the most computation power at the lowest price," Howard says.

What It Includes

For faculty and staff, OARnet will offer Microsoft's Exchange Online, a comprehensive messaging solution, features of which include:

- 5 GB mailbox allocated for each user; mailbox size configurable to 25 GB
- Shared calendar, contacts, and tasks
- Microsoft Office Outlook® 2007 and Outlook 2003 connectivity, including Outlook Anywhere
- Browser-based Outlook Web Access
- Virus/spam filtering via Microsoft Forefront Online Security for Exchange
- 99.99 percent scheduled uptime with financially backed SLAs
- Migration tools to help move current mailbox data into the online environment

The Exchange Online package should allow Ohio's colleges to maximize limited resources and redirect strategic funds, both in the short term and farther out. As a cloud-computing participant, this will also ensure that Ohio is considered an active participant in "Green IT," a national initiative to reduce IT-related costs, increase productivity, and improve performance while minimizing environmental impact.

The package offers students, alumni, and applicants access via Microsoft's Live@edu, which provides hosted e-mail built on Exchange, calendars, online workspaces, mobile alerts, document sharing, instant messaging, blogs, videoconferencing, mobile access, and address books.

Several Ohio universities already have deployed Live@Edu, and many others are reviewing the package as well. On Exchange they get a 10 GB in-box allowing 20 MB attachments and an integrated directory with faculty/staff. Other features are shared calendar and contacts, password-protected online storage for 5 GB of documents up to 25 MB each, and an extension of Microsoft Office. For those who do not have Office, it is still possible to do collaborative work.

Students will get Live Skydrive, a program that lets them store documents online so they can access them from any computer and share with others. This is supported by 25 GB worth of password-protected online storage and the ability to create either private, shared, or public folders.

Down the Road

Joint purchase of cloud-based solutions may not be for everyone. But things look good so far. "You get your best value if you can aggregate demand," Howard says. "If you are ready to go this route, it's worth looking at. If your culture is not ready, then some consensus building is required. But the economics are pretty compelling," Howard says.

Howard says it still is too early to say what went right or what went wrong with the plan. "I'd anticipate this deal will be revisited fairly regularly," Howard says.

Part of the reason for regular review is that cloud computing is on the cusp of becoming a commodity service. "Once you drive the toolset into a commodity, your cost of transformation becomes low," Howard says. One concern is the cost of transferring accounts to someplace else, if required. "You need a vendor who will provide migration," Howard notes.

Meanwhile, some schools in the Ohio system are taking other steps to combine operations like human resources or payroll at one shared service center. "It is a model that proved it can work in industry. Given the IT infrastructure, it can work for us," Howard says, again emphasizing the need for strong SLAs.

Curt Harler is a freelance writer who specializes in technology topics. A contributing editor for the Journal, he has had an article in every issue since we began publishing in 1997. Reach Curt at curt@curtharler.com.

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From Macrocells to Femtocells: Cellular Coverage and Capacity Enhancement Demystified

Jeff Carpenter
Michigan State University

An unfortunate irony is that the mobile devices that make our lives simpler require a highly complex and capital-intensive back-end support infrastructure. Massive marketing campaigns have convinced the public at large that cellular service is available almost everywhere and that the wireless experience should mirror the wired experience. Those of us who support wireless users know this is not the case, because we have seen what the fine print on the marketing campaigns really says: Service in many places is less than desirable and may remain so for a long time. Cellular carrier–funded projects will solve only a portion of the problem, and therefore it is up to us to step in through both user education and the use of advanced technology to fill gaps in service where practical.

At Michigan State University (MSU) we continually strive to improve the licensed cellular mobile experience on our 5,200-acre public campus.

Carrier Permission: What Is the Big Deal?

Cellular carriers, not end users, are the Federal Communications Commission (FCC) license holders. Telecom policy 101 teaches that you must have permission to retransmit frequencies if you are not the licensee. This is one of the primary reasons for the creation of the FCC under the Communications Act of 1934; our airwaves were chaotic prior to FCC oversight as everyone did as he pleased with radio frequency transmissions. Purchasing a cellular enhancement system is like buying a car. Anyone can look at the car, but if you do not have a driver's license, you cannot take it on the road. Likewise, there are myriad product vendors that will sell you a cellular enhancement system, and you can buy the system, but you must work with the respective carrier and obtain legal permission to turn it on, to "drive it down the road."

In addition, you must realize that you become an active part of a network that you do not control when you activate equipment on licensed frequencies. Cellular networks serve a critical role in emergency communications, and cellular enhancements that are implemented incorrectly can easily cause RF havoc on the broader cellular network, affecting users outside the confines of your intended coverage area.

Many RF engineers for major cellular carriers tell me their teams do regular drive tests that scan for illegal antenna installations, especially for those causing interference on their network, and they have used local law enforcement or court orders to shut down offending systems on numerous occasions. Would it not just be easier to work with the carrier from the start? One would think so, but sometimes this collaboration is easier said than done.

To obtain carrier permission can often be time consuming and extremely frustrating. Each company has a different approach, and each regional/local engineering team within a company can have its own opinions that conflict with supposed companywide policies. Quite frankly, just figuring out who to speak with about retransmission agreements or recommended products for a specific set of frequencies can be difficult. Start with your local sales office if you don't already have a local RF engineering or site-development contact with each carrier in your

market. They will eventually realize your questions are beyond their area of expertise and will point you in the right direction. If you make the effort to reach out regarding your cellular enhancement project, to collaborate with the carrier from day one, you will gain a valuable contact—someone you can turn to on a variety of issues in the future. You will be on the "inside," and that is something that any technology professional can appreciate.

Coverage and Capacity Enhancement: What Are My Options?

There are a plethora of options available for cellular coverage and capacity enhancement: macrocell, macrocell on premises, outdoor distributed antenna system (DAS), bidirectional amplifier, indoor distributed antenna system, picocell, and most recently femtocell. To demystify the clutter, here are straightforward descriptions of each option, starting with the most general (and likely most familiar) coverage options and wrapping up with the newest and most geographically targeted solutions.

- **Macrocell:** Imagine a typical cellular tower along your local road. This coverage approach is as old as the cellular phone itself. Carriers construct towers on which to mount antennas that connect to equipment at the base of the tower and ultimately to their switching network. They also use existing structures such as rooftops to locate antennas and equipment. This infrastructure makes up what is commonly referred to as the macro network. It is important to keep in mind that this network is in flux and will continue to evolve regardless of what you do on or in your own buildings. This highlights the importance of collaboration with your local carriers so that interference and system duplication do not occur.

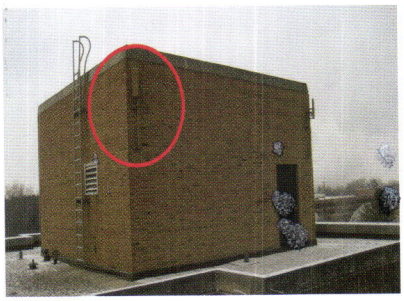
At MSU, we embraced this concept early on and, through collaborative relationships, ensured that the carrier's plans (after all, it is their network) were fully realized before we attempted to install equipment on our own.

- **Macrocell on premises:** A popular option for campus environments is to negotiate a lease for a macrocell to be placed on campus property. This is typically a multi-antenna site located on a rooftop or an existing communications tower, and the addition of high-power antennas on premises certainly enhances service for the surrounding area.

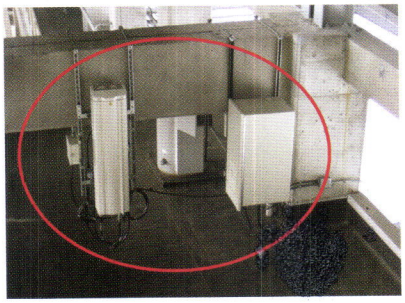
- **Outdoor DAS:** One problem with a macrocell is that it tends to cover a very large area with the same frequencies. Some carriers have started to implement microcell technology in the form of an outdoor DAS to address this issue. A microcell, like it sounds, is just a smaller version of a macrocell. Carriers are able to reuse frequencies multiple times in a given geographic area by mounting a larger number of antennas at lower elevations and transmitting at a lower power. This results in more capacity for end-user connections within a limited set of licensed frequencies. An added benefit is that in-building coverage is improved by moving antennas closer to end users. DAS equipment typically interconnects to a main distribution hub via optical fiber and subsequently to the carrier's backbone infrastructure via copper or optical fiber.

Indoor antenna

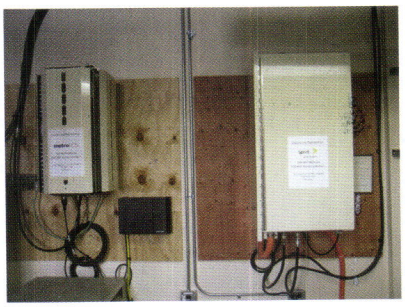
Outdoor DAS



Outdoor DAS



Outdoor DAS equipment cabinet



Outdoor DAS equipment cabinet

DAS networks have been deployed in major metropolitan areas and in dense suburban campus environments like MSU. We have distinct outdoor DAS networks from four major carriers in operation and one more in the planning stage. These networks leverage our excess dark-fiber capacity through a unique lease-agreement approach that has proven to be very favorable to both us and each carrier.

- **Bidirectional amplifier:** The simplest form of in-building enhancement is a bidirectional amplifier (BDA). This proven technology is well suited for single-carrier installations in small- to medium-sized spaces, especially basements. BDAs are a relatively cost-effective solution if you have the right engineering skills in-house, and when combined with cooperation from the carrier, these systems can be deployed quickly and successfully. Challenging aspects of BDA installation include accurate site surveys, rooftop donor antenna installation, and limits to the distance between the donor/subscriber antennas and the electronics. Other factors include proper tuning of the system to meet coverage needs, and although modern BDAs have more sophisticated software to assist in system installation, nothing can replace the value of a skilled RF engineer on site.

BDAs also are commonly used to "feed" RF signal to indoor DAS neutral host distribution systems since each carrier can specify the BDA product it prefers for its licensed frequencies.

- **Indoor DAS:** If a BDA is a simple form of in-building coverage, then an indoor DAS is the opposite extreme. While it is true that BDAs often feed RF signals to an indoor DAS, the similarities end there. An indoor DAS deployment, often referred to as a neutral host system, aggregates services from multiple carriers across wide frequency ranges. These wideband systems are highly configurable to meet demanding in-building scenarios and usually cover the popular licensed frequency bands located sporadically between 800 and 2,300 MHz. The newest bands in the 700 to 800MHz range are slowing creeping their way in to these systems. Indoor DASs have a host unit that interconnects with remote antenna units much like outdoor DAS. However, a major distinction is that indoor DAS hardware can typically accommodate either optical fiber or lower-cost coaxial cable distribution throughout a facility. Detailed site surveys must be conducted by a qualified engineer to ensure the installation does not interfere with nearby antenna sites or other services.

We had a case at MSU where too many antennas were installed in a given area because a proper site survey was not conducted. This resulted in excessive signal levels and problems with dropped calls just like before there was any service at all. Design and commissioning by a skilled professional is very important.

- **Picocell/Femtocell:** Think of a picocell or a femtocell as a personal cellular site in your office or home that enhances coverage for your carrier's licensed frequencies. These two unique-sounding terms are used interchangeably in the marketplace, and both provide cellular service in a very small area and for a very small number of users, often six or less. Picocell technology has been around since at least the 1990s and was traditionally deployed and owned by each carrier. Leased circuits (i.e., T1) would connect the devices to the carrier's switching network.

Femtocell products are a more recent development and are mostly designed to be purchased and installed by small office/home office users. Carriers are starting to embrace femtocells because they provide a level of control over their licensed frequencies not possible with BDAs or traditional indoor DASs. Principally this is because each unit connects directly and securely to the carrier's switching network over the commodity Internet using encrypted Internet protocol transport. The femtocell becomes an integral part of the carrier's managed network, and rogue units can be adjusted or simply deactivated if required.

Network managers should become acutely aware of the bandwidth and quality-of-service requirements this emerging technology places on IP networks. One consolation is that femtocell products reduce demand from dual-mode cellular/WiFi handheld devices on precious unlicensed WiFi bandwidth that was never really intended to accommodate cellular network handoff.

Final Observations: Lessons Learned

Here are tips to consider when managing a cellular coverage and capacity enhancement project, especially when you attempt to add multiple carriers to a single system.

- Legal documents such as retransmission or lease agreements should be standardized whenever possible. Each carrier may ask for minor tweaks, but standardization will result in a much smoother relationship with legal counsel on both sides of the negotiation. Be sure to include chargeback provisions to account for your time on carrier-funded projects and clearly identify facility security and access protocols.
- Engage your physical plant or equivalent group responsible for building maintenance early on in the process. I am fortunate to have a very productive working relationship with key units in our physical plant, and this is a huge benefit when projects require specialized rooftop or in-building structural modifications. Cellular infrastructure requirements are often unique, and support from all decision makers is crucial for timely project success.
- Subcontracting is a bit of an epidemic in the cellular world. I thought I had seen a lot of subcontractors on projects until we started our outdoor DAS implementations. Interaction with five or more internal carrier divisions and 10 or more subcontractors is not uncommon. Be prepared to host site walkthroughs on perhaps a dozen or more occasions to bring yet another new subcontractor up to speed on the project. MSU went so far as to hire a student employee (enrolled in an IT/telecom program at MSU) to help oversee subcontractors during the peak of outdoor DAS installation.
- Site inspections by qualified personnel familiar with code and any internal requirements are critical. As-built documentation and pictures of each installation should be supplied by the general contractor so you have records to provide field technicians in the future, just like on any complex technology project.
- On any project be sure to have a clear post-cutover support process in place that gives you access to the carrier network operations center to report any issues and requires carriers to contact you prior to arrival on site. Carrier representatives will appear out of nowhere years after project completion needing information or to assist in system repairs, and confusion can be avoided by having a communication plan already in place.
- Recognize up front that your project will likely exceed the initial timeline. This may seem obvious given the nature of modern technology projects; however, in my experience, cellular carriers are especially notorious for overpromising on timelines.

After all is said and done, you must accept that wireless users (including yourself) will always complain about service no matter how many capital dollars you spend or how comprehensive your strategy. If you focus on both user education and implementation of advanced technologies where practical, you will enhance the mobile user experience and in your own way help to demystify cellular coverage and capacity.

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Ronald K. Machtley

President, Bryant University

The Honorable Ronald K. Machtley became the seventh President of Bryant College in 1996. Under his leadership, Bryant has experienced a transformation in its facilities, academic programs, residential campus life, technology, and athletics to Division I, which has resulted in national recognition. On August 25, 2004, Bryant College became Bryant University.

Since 1996, applications for the undergraduate programs have increased by 212 percent. There are approximately 3,400 undergraduates from 33 countries and 30 states, and 425 graduate students in a variety of master's level programs.

Prior to assuming his duties at Bryant, President Machtley served as a United States Congressman for the State of Rhode Island from 1989 to 1995. He was a member of several committees including the House Armed Services Committee. Indicative of the esteem of his congressional colleagues, he was elected President of his Congressional Class during each term that he served.

Prior to serving in Congress, President Machtley was a practicing attorney. He co-edited a book titled The Telecommunication Act Handbook.

A 1970 graduate of the U.S. Naval Academy, Mr. Machtley earned a juris doctorate in 1978 from Suffolk University Law School. He served on active duty in the U.S. Navy and retired as a captain from the U.S. Naval Reserves in 1995 after 25 years of service.

ACUTA: Part of your mission statement is "The integration of advanced technology in the curriculum." How do you support faculty—particularly those who grew up before the advent of personal computing in the 1980s?

Machtley: You can include me with those who have gray hair and grew up before the advent of personal computers. I was an engineering undergrad in the '60s when we key-punched stacks of Fortran cards only to discover that there were maddening errors. When I came to Bryant in 1996 we made a decision early on to be a leader in technology, so we launched some fairly aggressive strategic initiatives. Right away we decided to provide laptops to everyone on campus-- every student and faculty member. We gave the faculty laptops a year in advance of the students and offered voluntary classes. The first question many of them asked was "What does this mean? What do you want from us?" We explained that we wanted them to be ahead of the curve and able to communicate utilizing the emerging technologies, because that was our future.

We didn't mandate how faculty members were to use computers, but we made it clear that within a year every student would have one. They understood the need to get up to speed quickly and adopt the new tools, and we never had any faculty resistance. We provide a faculty resource person, and we hold ongoing classes even now because the technology and educational applications continue to evolve. We go from one version to another and it's just as common for people to be using technology today as it is for them to be using a pen and pencil.

ACUTA: What technology challenges do today's freshmen face as they arrive on campus?

Machtley: Technology gives students access to so much information that it can be overwhelming for them. At Bryant we established the Bello Center for Information and Technology to bring our library and technology resources together for the students' benefit. This landmark building, designed by Gwathmey Siegel & Associates Architects, is home to a wealth of electronic and print resources, including access to more than 48,000 electronic journal subscriptions and our Digital Commons, a centralized repository for the entire campus community. To enhance the access and delivery of information, our librarians use up-to-the-minute technologies and reach out to students via Twitter, text messaging, and IM. Increasingly, students use their cell phones and smart phones for everything, and they're accessing information 24/7. We strive to meet the students where they are.

The challenge for faculty is to never lose sight of the fact that technology is only one form of presentation, and that the pedagogy of learning is not just to make the same Powerpoint presentation every semester. It's challenging because students know more about practical use than anyone. Faculty are adapting to new technologies and understand that technology is an important part of what will become new pedagogy, but pedagogy still involves interaction with students.

ACUTA: As a former congressman and someone who was behind the scenes when the Telecom Act of 1996 was being written, do you take a special interest in the legislative and regulatory process as it affects

campus technology? What would you like to see the current Congress run up to the FCC at this point?

Machtley: The expense of maintaining and upgrading our technology infrastructure is huge for colleges, and it's one of the factors contributing to rising tuition costs. Software is another big expense. Federal legislation needs to provide initiatives for contributions to reimburse higher education for those investments. On our small campus, for example, we have an annual capital investment of $3.6 million. Congress needs to be developing pilot programs to help colleges upgrade their systems. Grants should support green data servers and paperless initiatives that harness technology-- not only in the classroom but also for administrative purposes. For instance, Bryant worked with IBM and APC to consolidate our enterprise-class data center. The new center delivers significant energy efficiencies along with capital and operational cost savings, as well as providing a compact yet highly scalable infrastructure that underscores the University's commitment to environmental sustainability.

ACUTA: How do you anticipate the technology landscape on the Bryant campus will be changed in the next 3 or 4 years?

Machtley: Certainly we are going to go to more cloud computing and site-licensed core software. We've already developed strategies with Human Resources, alumni, and student e-mails in cloud computing. We will see much quicker integration of technological tablets, which are getting better, and e-books/ netbooks. I've used the Kindle and we have Kindles available at our library, but it's an early adopter stage—it's expensive, and it doesn't do everything one needs to do.

Within five years we're going to see new ways to integrate teaching, textbooks, cloud computing, and tablets, which I believe will revolutionize what's happening in the classroom. Students currently pay $500 per semester for textbooks, and that's going to disappear. The students entering college in five years, those that will comprise our Class of 2020, have been raised on video games and smart phones. Using sophisticated technology is second nature for them, and they're right to expect that we'll utilize equally sophisticated technologies for teaching. The frame of reference those students bring to their higher education experience is going to have a profound impact on our pedagogy.

With greater bandwidth and technologies such as Skype and TelePresence, we're going to see more asynchronous learning processes with students taking courses both here and in other locations. We've already delivered classes with asynchronous learning and collaboration with our students in China. The landscape will continue to change as new technologies and products emerge.

ACUTA: At a time when digital information is growing at a rate eight times the volume of information housed in U.S. libraries, what advice would you offer to campus leaders dealing with information overload? Where are you taking Bryant?

Machtley: The primary thing-- before you get into applications, cloud computing, e-textbooks and other exotic bells and whistles-- is developing a dependable network infrastructure. If you don't have that, forget everything else. People say they're going to have new applications on PDAs or this or that, but if you don't have the network to deliver those once you've raised expectations, you're going to generate a lot of disappointment.

Second, you need some very smart people who can be trained on a regular basis, who are participating in conferences and up to speed on what's coming, people you can deploy as your change agents. The president can't keep up on his or her own; I need someone who is my go-to when it comes to distilling information down to what it is we're going to do and how we can do it in a way that is reliable and not obsolete as soon as we've implemented it.

ACUTA: According to an IBM study of organizations in 17 different countries, organizations and businesses have not been deterred from strategic initiatives to increase productivity, improve efficiency, enhance customer service and turn mountains of data into meaningful insight, despite a clear recognition of the need

to cut costs in a difficult economy. What future new initiatives are you considering to enhance customer service and improve efficiencies at Bryant?

Machtley: Customers are more sophisticated than ever before, and they are very much interested in sustainable, green initiatives. So we are focused on paperless processes. Students register online, go to the bursar online, communicate online—they do everything online from the day they apply until they graduate. To sustain continuity of service we require dependable systems, and we're fortunate to have a dedicated staff team. Increased mobility helps enhance our productivity, and toward that end we're working with Cisco, Nokia, and T-Mobile to pilot test a dual-mode phone that leverages our Cisco IP network and VoIP capability. Participants use the dual-mode smart phones as extensions of their desk phones, and increase productivity by 35 percent.

ACUTA: Years ago there was a chasm between the academic community and the technical department. Has that been your experience?

Machtley: Early in my tenure we had some pushback between classroom users and the staff regarding the reliability of our systems. Part of our strategic plan was devoted to a reliable network. Establishing a compatible system throughout the campus was vital. When anyone walks into any classroom, he or she has the complete package-- overhead projector, docking station, and other technologies-- so that as the professor or student moves from classroom to classroom the experience is seamless and user-friendly. We've created a help desk that is exceptionally efficient and always open. Students have access to our Laptop Central support team. We maintain our own computers. We can service them right away in most cases, and if we have to send them off-site we provide loaners. Our faculty really appreciate how good our systems and our people are.

ACUTA: How do you bring technology to the strategic planning table on your campus?

Machtley: We currently have five strategic pillars to our plan. One of the pillars is facilities and technology. Every one of my vice presidents has a goal in technology. Their staffs work out the details for shared goals, and good communication helps us avoid the silos that lead to disconnects.

ACUTA: Bryant won ACUTA's Institutional Excellence Award in 2005 for your Converged Network Infrastructure and again in 2008 for your Collaborative Public Safety Network. You obviously have a forward-thinking and capable staff that is well supported by the administration. What has been the long-term impact of these projects?

Machtley: Many colleges and universities visit our campus to learn from what we're doing and how we're integrating technology and education. Our practices are best practices, and our converged network and green data center serve as models for others. We have developed wonderful industry partnerships with Cisco, IBM, Emerson Electric, Lenovo, and others, and those partners share beta technology we test in prototype. They know we have the capacity and the people to execute a plan. For example, we're currently working with Emerson Electric on cutting-edge prototype temperature- and light-sensing devices to save on energy. They're willing to work with us at a very low capital investment because it's prototype. That not only helps our budget, but allows us to evaluate the strengths and weaknesses of these products. We will be well ahead in the learning curve when the device hits the mainstream market.

ACUTA: Are there any special challenges Bryant is facing, unique solutions or new initiatives you'd like to share with our audience?

Machtley: Universally, higher education is facing budget constraints as we look at tuition growth versus changes in family income. That's why I think Congress needs to invest in making sure that the technology at colleges and universities is leading edge. As our graduates go out into the work force they are going to be taking that foundation of technology with them. Budget restrictions are a major concern, and if the evolutionary pace for technology continues to accelerate we could fall behind rather than getting ahead. You can't afford mistakes when you have limited dollars, yet most institutions don't consolidate their decision-making on technology. That's essential, because you can spend a lot of money on systems that are incompatible and unsustainable.

ACUTA: Are there any other ideas you'd like to share with ACUTA members?

Machtley: It seems to me that our biggest challenges are managing technical obsolescence in the context of finite resources for replacement and renewal, and satisfying the need for ever-increasing bandwidth. Bryant's converged network handles everything-- a rich variety of voice, video, and data applications that enhance learning and collaboration. Our networking resources extend beyond the classroom, boosting administrative productivity and improving our students' career opportunities.

We have to figure out as quickly as we can how the integration of cloud computing and e-books will change the landscape of teaching, and get people to think not just about the technology but about the pedagogical impact of technology. How do we achieve our best teaching and learning when people have so many new ways to integrate technology?

My final thought is that good people are absolutely essential. We looked for someone who could lead our technology program and was knowledgeable, and I'm very lucky to have Dr. Art Gloster as our vice president of technology. He makes us all look good.

ACUTA appreciates Dr. Machtley taking the time to speak with us and share his insights into these timely issues.

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Thanks to these companies that exhibited or sponsored at one, two, three, or all four of our events in 2009. ACUTA members are their potential customers, but representatives from many of these companies have also become our partners in success as well as our friends. As they determine whose events they will attend each year, ACUTA is glad they have chosen ours!

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Distributed Antenna Systems—Sometimes You Just Have to Do Things Yourself!

Ron Walczak
Walczak Technology Consultants

Verizon started asking the question "Can you hear me now?" in 2002. Sadly, the answer is still "no" in many buildings on campuses across the country. And, it's not just Verizon—it's all carriers. Those 100-year-old buildings that look so great in brochures often present challenges to your own infrastructure and network engineers due to their design and construction materials. They also cause problems for the cellular carriers.

In 2010, getting cell signals into basements, mechanical spaces, and the core of such buildings is becoming the next *must have*—and for good reason. Consider the following:

- Student telephone services are being discontinued on many if not most campuses; the revenue has dried up, and the proliferation of cell phones is used as one of the justifications for not needing dialtone in student rooms; and
- The rapid deployments of emergency alert systems since the campus tragedies of 2007 rely heavily upon cellular transmission of emergency alerts to students, faculty, and staff. The realization that an emergency alert system cannot reach its intended audience has many schools painted into the proverbial corner.

Despite all the hype, cellular carriers don't install $250,000 repeaters for bragging rights. They do it to capture market share and revenue. Some campuses offer carriers great locations for repeaters that serve campus needs (building penetration) as well as the carriers' (expanded coverage within and beyond your campus)—so they will pay rent to be there. That win-win scenario is becoming more scarce as carriers have built out their networks using other properties made available to them while schools either didn't see the opportunity or could not decide the best course of action when approached. Truly a "you snooze, you lose" scenario.

So, assuming your institution is no longer in a position to entice multiple carriers to install repeaters on or near your campus, you may be forced to implement your own building distributed antenna system (DAS). Successfully implementing a DAS is as much about politics and compliance with regulations as it is about engineering.

Designing a DAS

A DAS can be designed to support all your wireless services: WiFi, cellular, PCS, paging, maintenance, and public safety. Because each application uses specific frequencies, you must decide which services you will support before you design the system and buy the equipment.

The two primary design objectives are coverage (can you hear me now?) and capacity (can I get dialtone?) It is very important to solicit input from your public safety department to understand its projected capacity requirements and the potential peak usage of the system (trunking engineering).

- Step 1. Gather your floor plans. (I know, I know, this is always step one when I write an article for ACUTA …) Accurate floor plans are critical to infrastructure engineering. And to make it worse, unlike cable distribution for LANs and telephones, now we need to know what the walls are made of so we can predict signal distribution. Oh, and we need to now know ceiling heights!
- Step 2. Decide which carriers and services are going to be repeated within buildings. This is not a "committee of one" decision, and it will affect the equipment selection as well as

the amount of time and effort needed to negotiate agreements that keep you legal and prevent RF interference.

- Step 3. Take actual "current" RF measurements of the cellular carriers and other radio systems you want distributed. Put these readings on your floor plans as your baseline. You will undoubtedly find that some buildings or sections are fine as they are, eliminating the need for equipment in those areas. Take measurements outside the buildings as well (all sides and roof if you can get there) so you can determine the best placement for any off-air antennas.

Measuring cell phone signals can be done without the purchase of expensive test equipment or analyzers. All you need is an active cell phone for each carrier you are trying to amplify, and, of course, the time and wherewithal to conduct the survey. The BlackBerry Storm (Verizon and others), for example, allows you to access the *settings* to discover the actual received signal strength in dBm. Different handsets have different means of accessing the signal by putting them in *field test mode;* check with your carriers for instructions.

Now, you have an accurate map of actual coverage within your facility and can begin to design the required supplemental equipment to meet your goals.

Coverage and Capacity

The maps provide your target areas for enhancing coverage, but what about capacity? Those who have deployed WiFi know that one access point in a large auditorium will become overloaded, reducing the throughput for those associated. The same is true for a DAS. An estimate of the number of simultaneous conversations must be developed for each space served to ensure enough equipment is in place to handle the load. Further, the backhaul link to each carrier must be sized to accommodate the load.

For coverage design, work the design from the end user back to the central source. The central source can be a unique receiver for each building or a truly central point on campus that is fiber-connected to your buildings. The point at which your DAS connects to the carrier must have the capacity to carry the aggregate load. This connection can be off-air reception through an antenna farm, a T1 or fiber connection to the carrier, and in some cases, via your existing Internet connection (not recommended for large installations).

The Politics and Legalities of DAS

Cellular companies paid billions for exclusive rights to the frequencies they use for their service. It is illegal to rebroadcast in those frequency bands without written permission and proof that the rebroadcast is not creating interference with other licensed systems (see Title 47, Section 22.527, of the Code of Federal Regulations). If your DAS isn't going to improve their bottom line, they may not be interested in even participating in your project. The negotiations may steer you between a neutral host system (rebroadcasts entire frequency bands) and a discrete system with amplifiers specific to each carrier. To be clear, their participation is not optional. This component of your project is best left to DAS integrators with a track record of working with the cell companies.

The Consultant's Role in a DAS Implementation

The time and effort necessary to properly survey and record the results can be daunting. Outsourcing this activity to a consultant with the capability of creating scaled electronic floor plans for the potential integrators may be a logical option. The creation of an RFP and implementation management (the staples of most consulting firms) can also streamline and speed your efforts to get your users talking!

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Navigating Today's Complex Voice Road Map

Mark Katsouros
The University of Iowa

There's no doubt about it—voice is at a crossroads, and which path(s) to take is anything but obvious. One of the main reasons for this is a shift in the general thinking on quality versus quantity. As recently as a decade ago, anything less than *five nines* for enterprise communications reliability and quality was unacceptable. The phone had to work, and it had to work well. How else could we reliably communicate with colleagues and customers? And how could we ensure that we had the ability to place emergency (911) calls?

Fast-forward to the present day. First, our voice-quality expectations and senses have been dumbed down by our cellular phones and early voice over Internet protocol experiences. Dropped calls and less-than-crystal-clear call quality have practically become acceptable. Why? Not only because we've simply grown accustomed to them, but also because we have so many more communication options at our fingertips than we had previously. IP phone getting jittery? Take your cell phone out of its holster. Cellular signal strength no good? Make a Skype call, use e-mail or IM, write on a Facebook wall, or send a direct tweet. This vast quantity of available communication options has negated our quality issues and fears and, thus, created a new expectation, especially in these economically challenging times.

How many "phones" do you count?

Answer: Probably too many. Well over 10 if you count soft phones.

Squeeze the Costs Out of Enterprise Voice

In the early days of VoIP, toll bypass was all the rage. Using the Internet to transport voice meant avoiding those high-cost long-distance fees from the phone companies. But long-distance rates have plummeted, to the point that they're approaching zero, at least on the domestic side, and landline carriers, for the most part, have adopted the cellular billing model—domestic long distance included in one monthly fee. Sure, global companies can realize some savings with IP-enabled least-cost routing, but the real savings can be broken down into two big categories:

- Savings Category 1: Single Infrastructure

The savings that can be achieved by delivering all communication services over a single IP infrastructure are huge. Not only can you now build just one communications infrastructure for new construction (no more outside copper), but you also have just one to manage, maintain, and sustain. This ripples through to staffing and knowledge requirements as well, so your overall capital and operational burdens are significantly reduced. Yes, this undoubtedly means more investment in that single IP infrastructure (toward greater capacity, fault tolerance, virtual isolation, and so on); but these costs are expected anyway, as more and more mission-critical services are delivered over IP. Some might express fears that this single IP infrastructure now becomes a single point of failure, but the cellular infrastructure can serve as a reasonable backup for both voice and data (3G/4G).

• Savings Category 2: Customer Self-Service

This "feature" of IP-based telephony is often overlooked when assessing the overall costs of providing voice service, but it shouldn't be. IP phones, by their very nature, are portable devices—they can be moved, for the most part, from network port to network port with little if any configuration, much like computers can. And feature configurations (from coverage groups or paths to custom, variable ringtones) can potentially be accessed and modified by the end user. Essentially, end users can self-provision their voice service, performing their own MACs—moves, adds (at least on the physical "install" side), and changes. This is hugely significant when one considers the high costs of telephony "fieldwork" and configuration work that the enterprise funds as a whole. And "soft phones" (phones implemented entirely as a software application on your multimedia computers) make the savings in this category and the overall equipment savings even more obvious.

"But Wait, There's More!"

There are other significant areas of savings as well. Standard protocols such as the session initiation protocol (SIP) enable greater interoperability, fewer single-vendor dependencies, and less-expensive endpoints. They can also provide economies on the carrier side. SIP trunking, for instance, provides similar benefits on a wide-area scale.

New productivity features can also be realized. Living on the same infrastructure and speaking the same "language" (IP) as the rest of your information technology services allows for tremendous integration. "Killer apps" of all kinds (from more tightly integrated identity management, user directories, and call logs, to general database integration, location-based services, and rich media experiences) are now possible, enhancing overall enterprise efficiency, productivity, and security as well as your ability to deliver top-notch customer service. Group (multipoint) communication is also significantly enhanced. Finally, it's important to realize that the market has shifted so much in the direction of IP that even the traditional vendors in the voice space are no longer developing these enhanced feature sets for legacy telephony. In many cases, they simply wouldn't be possible anyway.

The Promise of "The Killer App(s)"

It is almost impossible to discuss IP-based telephony and converged communications in general without eventually arriving at applications—the very things that this convergence of technologies and platforms enables. Specifically, there's that Holy Grail of an application long referred to as "The Killer App." But what is the killer app? Is there one that rises above all the rest? There doesn't seem to be, because there are just so many possibilities. Here are just four that are revolutionizing the way we work; providing greater effectiveness, efficiency, and scope; and further enhancing our ability to communicate and collaborate:

• Killer App #1: Unified Messaging

Many people in today's workforce would tell you that voicemail is dead—an archaic messaging mechanism that's too hard to access and too untimely in its delivery. But unified messaging, especially its newly evolved set of features, may be creating a renaissance of appreciation for its acceptance and importance. Most would agree that the tone of a text or e-mail message is more likely to be misconstrued than that of a voice or video message. But, at least until recently, that hasn't been enough to counter the aforementioned access and timeliness issues. Enter unified messaging (UM). With UM, voicemail is as accessible, searchable, and "categorizable" as e-mail, because it ends up in the same place as your e-mail, i.e., your in-box. And, with the sophisticated speech-to-text transcription that some UM solutions include or have on their feature road maps, one can literally "see" into the audio files (particularly handy while checking e-mail during a meeting), search and filter on their content, and so on. Unified messaging brings together the richer experience of an audio message with all the benefits of the e-mail paradigm.

• Killer App #2: Mobility

The power of mobility hardly needs to be explained. Mobility is an absolute necessity, as is the requirement for customers and colleagues to reach anyone anytime, anywhere. Our campus communities are particularly mobile, but also particularly in need of staying connected. Fortunately, as our multimedia computers have become more portable (from desktop to laptop to netbook), so too have they enabled more mobile communication options in a converged environment. Now your soft phone can travel with you, especially with the global march toward ubiquitous WiFi (IEEE 802.11) and WiMAX (IEEE 802.16) wireless coverage. Yet, to customers and colleagues, it's as if you're sitting at your desk, waiting to take their call.

• Killer App #3: Presence

With all of this mobility and seemingly unlimited access to people, how do we keep *pervasive* from becoming *invasive*? One way is with the etiquette that intuitively accompanies the knowledge of *presence*. Presence is your advertised whereabouts or status (e.g., on the phone, in a meeting, heavy in thought, available to chat, etc.) Using a smart combination of computer activity monitoring, calendar integration,

and explicit settings, presence can make your location and/or your availability obvious to those whom you authorize to see this information. Technologies like GPS (the Global Positioning System) and radio frequency identification (RFID) make the notion of presence even more automatic, exact, and integrated.

• Killer App #4: Federation

Identity federation via SIP/SIMPLE (session initiation protocol for instant messaging and presence leveraging extensions) is a huge enabler of the kinds of communication and collaboration typical of higher ed—that is, across multiple IT systems, service providers, and, of utmost importance, institutions. With most modern IP-based voice systems, end users are required to authenticate (essentially log in) to access "dialtone," obtain their net-stored service parameters and features, provide updated presence information, and so on. By exchanging SIP domains and a few other system parameters, users from different institutions can securely communicate and collaborate as if they were on the same campus and even right down the hall from each other. From presence sharing to voice communications, federation helps make higher education's goal of global collaboration a reality.

"The Cloud"

It is often said that everything is cyclical, and telephony is no exception. Cloud telephony is much like the old Centrex phone service, except it is IP based, is quick and easy to deploy, and uses standardized systems and applications. And, like "outsourcing" phone service à la Centrex, moving voice to the cloud (essentially offloading what has become a computing resource from on-premises to Internet-hosted) has some advantages—mainly that the provisioning, operating, and maintaining of what many see as a commodity service is handled by someone else, allowing you to focus on your core business. However, therein lies a dilemma: Most in higher ed see communication and collaboration as major components of their core business and mission. Moving voice to the cloud potentially limits your ability to tie it together with all the other aspects of that communication and collaboration. And, as fast as this genre of technology is changing, there will likely be significant challenges in integrating cloud-based voice services with in-house collaboration resources.

There are also potential concerns with security, availability, and performance. The first may be debatable, as some might confuse control with security, not that they aren't related. But, as new technologies like HD audio come into play, the latter two become even more significant. Perhaps most important, there would likely be difficulty in bringing voice applications and systems back in-house as the cyclical nature of communication services runs its course.

The migration from Centrex to PBXs that began decades ago was mostly sparked because of the inefficiency and real-dollar costs of routing every call to the central office (even those placed to others within the enterprise, arguably the most common calls). Cloud telephony, to some extent, does the same thing. So whether the pros outweigh the cons is about as clear as a cloudy day.

Conclusions

Navigating today's complex voice road map is not easy. There are clearly advantages and opportunities with providing voice service as one of a set of integrated applications delivered over IP. IP-based delivery is essential for effective and efficient voice service provisioning, especially to the highly mobile and diverse communities of higher ed. Software-centric solutions provide further means of application integration, cost savings, and flexibility.

Keeping the control of this evolving technology close at hand is critical to being able to integrate with other in-house collaboration and location-based services, from calendaring to course/learning management to integrated security to RFID to simulations and virtual worlds to social networking.

SIP-based federation enables core aspects of communication and collaboration, from messaging to presence, to take place between our higher-ed institutions, fulfilling our collective goal of working together toward global problem solving.

Recognizing that communication and collaboration are essential for supporting the core mission of our higher-ed institutions is critically important to taking the right path and creating the optimal environment for teaching and learning, research, and innovation.

Mark Katsouros is the director of telecommunication and network services at the University of Iowa. The opinions expressed in this article are his and are not necessarily shared by the university, but he thinks they probably should be. Reach Mark at mark-katsouros@uiowa.edu.

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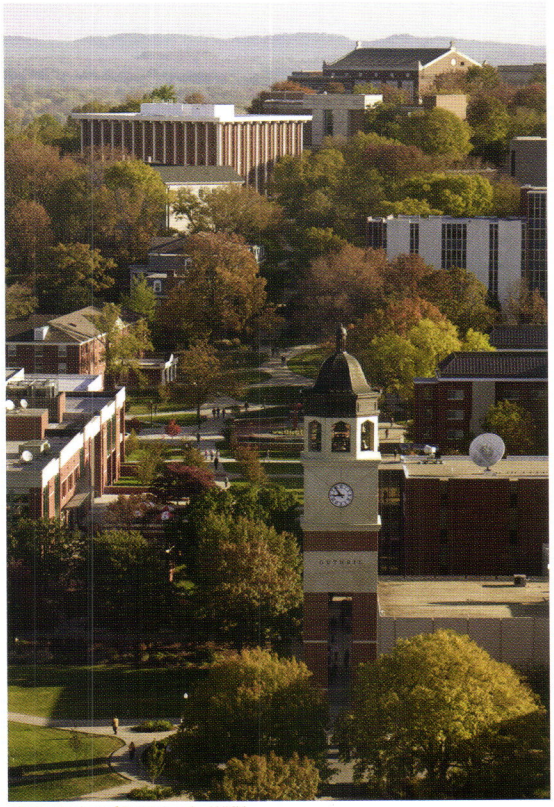
If You Build It, Will They Come?

Edwin Craft
John Bowers
Western Kentucky University

Change is the one constant in our professional lives as well as in our personal lives. Because technology has quickened the pace of change, especially over the past three decades, most of us would—perhaps grudgingly—admit that children growing up today are far more adept at integrating technology into their daily routine than we were at the same age. In our field, we have watched nervously as traditional voice systems have steadily journeyed down a path from mostly analog devices to IP phones and now on to unified communications. Traditional voice systems offered students access to one single conversation, but social networking sites are now engaging students by offering nearly instant communication with thousands. A study conducted by Western Kentucky University (WKU) in spring 2009 showed that 71.9 percent of our students have a Facebook account, and 39.2 percent have a MySpace account.



Photographer: Clinton Lewis, WKU

How do we keep up, and what's next? The challenge of positioning our systems at the forefront so they will not become obsolete while at the same time not stepping over the line to the "bleeding" edge of technology has become difficult indeed.

As a university tries to define the shape of its technology future, many considerations must take place, including the following:

- Defining the audience and what technologies they need to succeed while on our campus
- Making IT accessible
- Differentiating technologies
- Exploring strengths and weaknesses of different tools
- Developing deployment strategies
- Predicting how the technology will be used

Who Is the Audience?

Deploying a technology that was developed for corporate America to a group of 18- to 24-year-old students will probably result in failure unless it is well thought out; and even then, the students may not adopt the technology as we expect. In today's environment we always face the question, If you build it, will they come?

To obtain firsthand information that would help us answer that question, WKU and The Via Group (a company that supports unified communications technologies: www.theviagroup.com) developed a program that we call "A Day in the Life of Kelley." Kelley is a senior accounting major at the Gordon Ford College of Business at Western Kentucky University. She also works in the IT department, and her core curriculum requires the use of a variety of technologies.

As a part of this project, Kelley is given access to many "cool" technology gadgets and software applications to see how they will fit into her daily life. During the first few weeks of the program, we learned that *our* ideas about what students would like and dislike were not exactly the same as our student Kelley's ideas and uses for that

technology. Most business applications and technologies were developed around a lifestyle that is different from what students experience today. For example, an IM client residing on a stationary computer does not give students access to the technology most of the time and will stay dormant. Today's mobile students will, as Kelley proved, choose technology that allows them freedom to move.

Satisfying your customers, whether they are students, faculty, or staff, requires that you know what they need and want. Conducting focus groups, brainstorming sessions, and surveys can provide insight that will help you identify customers' expectations and meet their demands.

Making Tools Accessible

As technologists, most of us are great at developing plans that include security strategies, redundancy, fail-over systems, and more; but sometimes we miss the mark completely when it comes to developing applications that both fit the needs of our students and are simple to use. We build the most resilient architecture to survive just about any disaster we can think of, and we protect it from everyone. Sometimes we protect it to the point where we have to ask the question "If you build it, can they access it?"

Today's students obviously are very technologically savvy, but they do not follow the same norms as our staff and faculty. If our systems are too hard to access, they will find another system that will serve the same need but allow them easier access to the technology.

In determining how to protect certain systems, questions should be asked regarding the technology. For example, is it necessary to protect certain systems or networks to the extent planned, or could the systems be placed outside of the secure area to allow greater access? If security is required, is it too complicated to be beneficial to the group requiring access?

Does One Size Fit All?

A supervisor from whom I learned a great deal once watched a vendor presentation about a software application that we "needed to deploy." It was a good presentation, and the software did look useful, but it was not exactly what we needed. At the conclusion of the sales pitch, my supervisor said, "That sounds like it is a good software for some places, but I have a size-12 foot and it appears to me that you are selling a size-9 shoe. It just will not fit."

He was absolutely right; a size-9 shoe will never fit a size-12 need. In this case, we had developed an in-house solution that fit the needs of our university exactly, whereas this software provider had built an application that tried to fit the needs of many individuals—which brings up the question "Should you build it?" There are many variables—practical considerations— that will affect the answer:

- Do you have personnel with the necessary skill set to devote to the project?
- Does a tool already exist, and does it do what you want it to do?
- What is the time frame for the project, and can you develop the solution in time for the need?
- What are the cost comparisons?

We recently found ourselves facing these questions at WKU when the university wanted to deploy a mobile application. We formed a mobile device task force to identify what services we would like to deploy. After identifying the services—such as access to university calendar information, course schedules, and grades—we began to research the build-versus-buy question. At the time, deploying applications for mobile devices was a new technology, and very few staff members were adept at the programming languages. We were also engaged in many other time-intensive projects. Resources were short, as was our time frame for deploying a solution.

We began to investigate outside sources for solutions that would meet our need, and we discovered that most of the same services we wanted were being offered to users at Stanford and Duke. The developer of those applications was a company called Terribly Clever. Terribly Clever was acquired by Blackboard in 2009. Since Blackboard is also the vendor that supplies our campus course-management system, and we already had a close business relationship with them including a statewide purchasing contract, we contacted them for demonstrations and discussions, and eventually made a decision to purchase their solution.

The iPhone app that Terribly Clever developed for WKU offers a searchable campus directory; access to all course catalogs searchable by any word by title, instructor, or description; campus maps using the iPhone geolocation capability; news releases; campus photos and video content; athletics information and news; events calendar, and more. Blackboard calls their product Mobile Central, but the institution may customize it with any name. We are currently working through an implementation guide in order to give Blackboard the Web services, RSS feeds, XML files, and other data access they need to create these services. The services will be offered as an app for iPhone but will also be available separately as a mobile website available to any Web-enabled mobile device.

The decision to purchase this software was made in December 2009, and WKU plans to roll out the application in March

2010 to coincide with registration and orientation for new first-year students who will start in the fall semester. We anticipate the app will be useful to new students: for example, the map service will help them locate their classes, and the searchable course catalog will allow them to become more familiar with their registration options. We also think that other audiences such as parents and alumni will be interested in services such as news, athletics, and events.

If They Come, Who Will Train Them?

Most of the younger generation is very adept at learning new software applications or breaking in a new mobile phone. In an annual survey conducted by WKU, students responded to the question "When you want to use a new function or feature in a software application, what do you do first?" Results showed the following:

Trial and error.....51.1 percent

Read the manual.....17.6 percent

Online resources.....17.5 percent

Ask a friend.....13.1 percent

WKU has taken a new approach to technology training. Our faculty/staff technology training program focuses on providing an extensive collection of self-service video tutorials. Video tutorials are short, Flash-based animated sequences of screenshots with voiceover narration and captions, designed to illustrate how to perform technology tasks in our supported software applications. The video tutorials are scripted, produced, and narrated by our campus trainers, and are fully customized for our audience of faculty, staff, and students. Most are less than five minutes long, intended to answer one or two "how-do-I" type questions. We currently have more than 300 video tutorials in 23 software categories on our index site: http://www.wku.edu/videotutorials.

Our IT division trainers develop new video tutorials using Adobe Captivate software, then output the final result to HTML with embedded Flash files. Flash is highly convenient for our campus desktop/laptop computers, since it runs in virtually any browser. It is a format that is supported for a few mobile devices, but not all. Notably, the iPhone cannot play Flash files. To accommodate iPhone users and other Web-enabled mobile devices, we have used conversion software to create alternate versions of all our video tutorial files. Mobile users can easily access them from the central video tutorials index page.

Why Build It?

Needs for mobile applications arise from every corner of campus. Twenty years ago mobile phones and applications did not exist. Today we wonder how we ever lived without them. Our study showed that 97.8 percent of our student population own a cell phone and 78.6 percent of those students use them for texting.

If we ask "Why build it?," we don't have to look far to see that new technologies are opening up possibilities we never dreamed of just a few years ago. In new and often unexpected ways, we are setting loftier goals than ever before because we are able to meet them.

For example, crisis management has recently become a top priority for most campuses, including WKU. Most universities have at least begun looking for solutions that can alert staff, faculty, and students regardless of their location when events are occurring. One week after WKU rolled out our SMS notification system in January 2008, we sent out a message to more than 15,000 students for a weather closing. Since that time, the system has been used on numerous occasions for various needs of the campus.

Technology is critical to the educational mission of the university today, and that takes the role of the technology professional to an exciting new level. It's really a field of dreams.

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John Bowers is director of academic technology at WKU. Reach him at john.bowers@wku.edu.

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Maximizing the IT Budget for Success: The Sage Colleges' Journey of Efficiency and Creativity

Jonathan Brennan
The Sage Colleges

I'm sure that I don't need to tell you how tough times have been over the past year, and how the current economy continues to challenge consumers and professionals. Banks are folding, investments are crumbling, and people are being laid off. As a result, businesses and institutions of all shapes and sizes are looking to technology to improve productivity, enhance services, and minimize costs. In most cases the responsibilities of IT departments are added freely, but gaining the resources needed to accommodate the extra load is often impossible—and in some cases, the resources are shrinking along with the budgets.

IT staff at The Sage Colleges, an independent private institution of higher education located on campuses in Albany and Troy, New York, focus on providing quality services and support to the Sage community in the most efficient and effective ways possible. The technology solutions we implement offer the possibility of great savings, increased productivity, or decreased workload for the general college community, but they can also present challenges to the IT staff who support them. The challenges may arise from unforeseen problems during implementation, or there may be controls or limitations that users do not understand. Those users then perceive a problem and initiate a support request. The job of the IT department is not only to handle the new support issues but also to ensure that other areas of support are not neglected.

We have focused our efforts on three major questions:

- How can technology improve the productivity of our employees and the efficiency of our business procedures?
- How can we stay competitive by offering the latest and greatest technology services?
- How can we support two campuses in different cities without having a full complement of IT staff at each location and without sacrificing the quality of service?

As we addressed these issues, we became aware of how improvements to IT processes helped us improve the technology experience for faculty, staff, and students as well.

Improving Employee Productivity and Business Practice Efficiency

We started by examining the primary causes for wasted time at the employee and system levels. Of those causes, employee behavior is often the worst offender. We have a limited amount of bandwidth, and while it meets our needs, there is not much excess. While looking at server logs we noticed that YouTube and similar sites were consuming not only a considerable amount of employees' time but also a considerable amount of bandwidth. This is problematic because it also affects many business-critical applications on the network.

To counter this, we implemented a solution called PacketShaper (from Blue Coat). PacketShaper allowed us to create rules to reserve portions of bandwidth for specific types of traffic while throttling others. Services such as YouTube, P2P, and gaming can be restricted to eliminate the impact on services such as e-mail, VPN, VoIP, and

security systems. Rules can be relaxed or lifted for classrooms or specific IP ranges. This allows legitimate uses of these services to be permitted while blocking nonbusiness uses. Employees remain more focused on their work because common distractions are limited, and the network runs at a more consistent and desirable level.

In addition, to address the user perspective, we were using a complicated 802.1x authentication on our wireless networks, which was secure, but the setup was too complicated for many users and often required IT assistance. The experience was painful for staff and students, and this pain was reflected in our annual satisfaction survey. Our networks were also a point of concern because of malware that could spread from an infected machine that was authenticated.

Our answer to this was a network access controller from Bradford, which allowed us to greatly simplify the user authentication. Users can connect to a nonsecure network without needing a network key. Once connected, they are redirected to a page that authenticates their domain account and downloads a persistent agent to their machine. A persistent agent checks conditions on the machine as defined by the IT department. It checks for the presence of up-to-date antivirus, a firewall, and certain Windows updates. Once the machine passes these checks and the agent is running, the user can then access the network freely without needing any more interaction for the duration of the semester. We can now breathe a little easier knowing that all computers on the network meet a basic level of security.

PacketShaper limits noncritical services, but as a further solution to our limited bandwidth, we also needed to improve the performance of critical services. To accomplish this, we implemented a Microsoft Internet Security and Acceleration (ISA) server to cache Web traffic. With so many of our critical services using a Web-based format, we can gain significant bandwidth savings by storing copies of these websites inside our network. When a user requests an image, page, or file that has already been cached, it comes from our network rather than the Internet. This significantly improves the delivery of content. A prime example is our e-mail, which is all Web based via a portal. Each time a page in the portal is loaded, the user's Web browser downloads about 400 KB of images. Multiplied by thousands of our users, it adds up fast. Having those images stored locally improves the load time exponentially.

Staying Competitive

The key to competitiveness is the ability to offer new or improved services. If an institution lets services get stagnant, the users' perceptions of the college will suffer. To stay at the front of the pack, we need to be able to provide the services that students need and want. In addition, the college needs to regularly examine its internal procedures and systems to see if they are maximizing their value and improving the return on investment. Often there are open-source solutions available that require very little up-front investment. While this can offer considerable cost savings or service improvements, it can also be a burden on IT departments.

Recently we implemented a system called Moodle (Modular Object-Oriented Dynamic Learning Environment). As an open-source (and free) online-learning system, it is a very robust and expandable solution that offers a much fuller feature set than its expensive predecessor. By implementing Moodle, we were able to save the college tens of thousands of dollars per year. The downside is that because it is open source, any and all issues land on the IT department to remedy, as there is no such thing as vendor support.

Because we place a high priority on supporting our users, we also leverage an open-source portfolio system for students called Mahara, which is integrated with Moodle to allow students to manage their portfolios from the same portal they work in. By supporting rich formatting, Mahara enables students to import personal multimedia content for future professional use. It is a superior and free way to add value to our institution and enhance the user experience.

Sage also switched to an open-source content-management system for editing our website called Reason. Before Reason, which is also free, we were using an expensive Adobe product to allow each individual department to edit its own section of the website. This involved installing and updating the software on more than 100 computers, as well as maintaining and installing a connection key on each machine to grant access. Reason is a Web-based system that requires no installation. All of the access is controlled at the server level, minimizing the involvement of IT and simplifying the process for the users. Departments can still modify their own sections of the site and gain a more user-friendly interface.

Because the user base for Moodle, Mahara, and Reason is so large, there are constant support calls. Typical issues can often be attributed to user error arising from not understanding the system. Reason and Mahara have significant multimedia components that can easily confuse the less tech-savvy users. Because they are open source, we have no vendor support, and

typical IT job candidates would have had no experience supporting these systems. Further, the general users themselves have typically never used these systems and will require training. However, once the users get past that initial learning curve, the experience is quite positive and the benefit to the college is significant.

Dispersed Geographic Locations

The Sage Colleges has two academic campuses, each with many buildings that are not physically connected. We also have athletic facilities across town and satellite offices at other colleges throughout New York's capital district. Situated in an upstate New York setting, Sage is at the mercy of Mother Nature's unpredictable and often hazardous weather conditions for the better part of the year. Frequent ice or snow storms make getting technicians to and from noncontiguous campus locations difficult, or even impossible.

However, even when the college is closed for snow, online programs still hold classes. With campuses in two cities, how do you split up your available staff? Do you split IT staff evenly between the campuses? Do you have a full complement of staff at each location? In addition, H1N1 and avian flu scares have recently prompted a movement toward pandemic planning. If the physical campus closes, the technology will be the key to keeping the virtual doors open. Classes can continue to meet online. VPN access can provide the link to the campus network and computers. The IT department needs to be able to continue to support these technologies while remaining safe themselves.

There are two commonalities among the tools discussed up to this point. All of them add some kind of value to the institution in one form or another, and they also add additional strain on the IT department. How do we cope?

Using Technology to Bridge the Gap

In 2016 Sage will celebrate its 100th year since the opening of Russell Sage College for women. The last few years have seen a considerable spark of renewed enthusiasm and growth. Consequently, the growth of the college as a whole is far outpacing the growth of the resources of the IT department. Technology has played, and will continue to play, a big role in that growth. Just as the technology previously discussed can improve efficiency and productivity for the rest of the college, so too can technology improve efficiency and productivity for the IT department.

To reduce the burden on the IT staff and ease the pain of dealing with increasingly laborious additional services, we have implemented some low-cost but effective solutions.

- First is DokuWiki, a free open-source wiki application. A great deal of productivity and momentum can be lost when IT employees leave their posts. They take knowledge with them that only they possess, such as best practices, tips, and known issues, leaving remaining employees to reinvent the wheel each time someone departs. Documenting job-related activities in a clearly organized wiki structure can minimize that information loss. It also serves to enhance the learning curve so employees can focus on the responsibilities at hand. As an added benefit, all departments on campus can use this asset.

- Microsoft System Center Configuration Manager (SCCM, formerly SMS) allows for remote installation of software packages and updates, including non-Microsoft software. Packages, files, settings, and scripts can all be pushed to a single computer, a group of computers (Active Directory driven), or to all connected computers. This tool saves enormous amounts of time on software installation requests. Technicians can simply select a client from the list, choose a package, and push the software. An on-site visit from the technician is not required. New software packages can be created within SCCM. It also provides hardware and software license management, which indicates usage statistics for software. These statistics can potentially lead to savings by eliminating the purchase of software that is already owned but underutilized elsewhere in the college.

- Windows SteadyState, a free tool from Microsoft, locks a computer at its current configuration. Changes made to the computer's files or systems are wiped out at reboot, restoring the computer to its original state. It is ideal for public workstations such as computer labs. It prevents the technicians from having to constantly fix issues in the labs when the students make changes. A reboot of the machine fixes any software-related issue. However, administrator changes, antivirus updates, Windows updates, group policy, and SCCM changes on the machine can be retained at reboot, allowing for seamless maintenance of locked machines.

- Symantec Ghost Solution Suite allows the cloning of one computer to many computers across the network (or one-to-one for fixing a single computer). This saves enormous amounts of time versus individually configuring each workstation. We use it to streamline the user migration process when swapping computers by scripting the copying of user files (My Documents, application data, settings, and others). It

improves user experience because data are not forgotten as often during PC swaps. Used in conjunction with Universal Image Utility, a single image can be pushed to any computer simultaneously regardless of manufacturer or installed hardware.

- KBPublisher, an open-source knowledge base, is very inexpensive and has had a significant impact on the college community. Our knowledge base contains hundreds of informative documents neatly laid out in categories. Getting this up and running can be a significant investment in time because all content requires that an original article be written. When complete, it can quickly become the first line of defense in lieu of calling the help desk. It provides self-help resources for the community during off-hours when IT is not around to help. It also supports audio- and video-enriched articles and has a glossary of terms. Glossary terms are then embedded into the articles in a clickable format that provides a pop-up description of the term.

- The remote support software LogMeIn Rescue has had the most far-reaching and visible impact on the Sage community. As a full-featured interface to the IT service desk, it allows users to connect in a multitude of ways, including a button on the website or an icon on their desktop. The support staff can use this to provide a consistently excellent level of support to all users, regardless of where they are physically located, anywhere in the world. Everything that happens in a LogMeIn session is permission based, meaning the user has to grant the technician permission to perform tasks. This puts a lot of privacy-sensitive minds at ease.

Users are first dropped into a chat with a technician who can attempt to diagnose issues. If the issue is complex, the technician can request control of the computer or share his or her desktop with the user for training purposes. Connections are initiated through the LogMeIn system, allowing connections outside of the firewall. Once the connection is initiated, it is handed off to the clients so there is no intermediary to slow things down. It even allows us to support BlackBerry, Windows Mobile, and iPhone.

This tool has provided us with a significant improvement in the first-call resolution rate by going beyond other remote support tools, thanks to the addition of very useful and functional features such as the ability to reboot the machine and reconnect automatically, even in safe mode; the ability to have certain users or computers jump to a higher tier of support to meet a service-level agreement; the ability to prompt for user credentials, which are saved for the duration of the setting to log users back in without requiring them to be present; the ability to start as a system service to maintain an active connection at logout; and a function to view and capture all system vitals and copy to clipboard for easy pasting into technician work orders.

Because our users now have an extremely easy interface to the IT department, the perception is that we have a massive support staff that is always there, waiting to help them. This tool allows us to increase the level of support we can provide while also greatly reducing the amount of effort required to provide that service.

Doing More with Less

In today's challenging economic climate, every institution needs to save money, whether the goal is to increase profit or just to maintain the student experience and daily operations. Whatever your needs may be or whatever your financial situation is, a keen eye and the right attitude will lead you to a solution that will suit your needs and budget.

As we all know, the IT department usually shoulders the responsibility for installing, maintaining, and supporting these solutions. Typically, the less a system costs, the more of a burden it is on the IT department in terms of support. We are certainly not gaining employees as fast as we are gaining responsibilities. So we turn again to the technology for the answer. By using various remote support and administration tools, we can automate functions and reduce the day-to-day workload of the technology staff who can then focus on the new work created by cost-saving techniques used elsewhere in the college.

Whatever your situation across the spectrum of challenges and possibilities, one thing is clear. We all need to do more with less.

Jonathan Brennan is director of IT services at The Sage Colleges. Reach him at brennj@sage.edu.

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2009 Ruth A. Michalecki Award

Carmine received the award from Awards Committee Chair Walt Magnussen, ACUTA President 2007-08, at Wednesday's Award Luncheon. Thanks to PAETEC for sponsoring the Award and the luncheon.

Carmine Piscopo, RCDD
Providence College

The ACUTA Ruth A. Michalecki Award was created in 2001 to recognize outstanding leadership among the ACUTA membership. Named to honor the memory of ACUTA past president Ruth A. Michalecki, University of Nebraska Lincoln, for her leadership of ACUTA and the communications technology profession, the award is acknowledged as one of the highest forms of recognition. Nominees must be ACUTA institutional members, associate members, or corporate affiliates.

The award consists of a beautiful crystal sculpture and a complimentary registration to the ACUTA Strategic Leadership Forum or the Annual Conference, along with air fare and hotel expenses to make it possible for them to attend. This is consistent with the principles of Ruth Michalecki, who was a true believer in the value of professional development and lifelong learning.

Nominations are submitted by peers and a winner selected by the ACUTA Awards Committee. Carmine Piscopo of Providence College was named the 2009 recipient of this award.

Carmine has been a member of ACUTA since 1985, serving as a representative of Providence College for that entire time. Carmine has proven himself to be a leader in ACUTA, serving as program chair, secretary/treasurer, and president of the organization. Along the way, Carmine has made many contributions to ACUTA and the higher education community as a speaker at numerous events and author of *Journal* and *eNews* articles, and serving as an encourager and mentor to many ACUTA members.

"Many of us looked up to Ruth Michalecki as a pioneer and leader in our industry during her active years," Carmine said. "I felt—and still feel—extremely honored when I was notified of being the recipient of the award that bears her name. I wish to take this opportunity to express my sincerest thanks to Walt Magnussen and the Awards Committee members for their nomination, consideration, and decision."

We hope that Carmine will continue to contribute his expertise to the association for many years to come.

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2009 Bill D. Morris Award

Patricia Todus
Northwestern University

The Bill D. Morris Award represents ACUTA's highest level of individual recognition. The recipient, in the estimation of the president, exemplifies the dedication, vision, professionalism, and leadership that Bill brought to this organization.

This year's recipient has proven her dedication and continues to prove it. Well known for the establishment of strategic IT planning at her institution, she has strengthened our planning sessions for many years.

She is known for breaking glass ceilings. When there were no degrees in telecommunications, she co-developed one and even served on the faculty, bridging the gap between academia and real-world experience.

When there were no corporate affiliate member directors-at-large, she appointed one.

When the concept of designing the residence hall for the 21st century emerged, she was tapped for her expertise.

When she recognized the need to provide leadership training to the ACUTA board, she organized informal sessions, complete with reading assignments and recommendations.

When the higher-level ACUTA Forum for Strategic Leadership in Information Communications Technology needed an institutional chair, she accepted the responsibility and the honor.

This year's recipient became my mentor, as she is to many others.

In her quiet, yet knowledgeable, unassuming, and determined manner, she provides much food for thought, encouragement, and emulation.

The 2009 Bill D. Morris Award went to ACUTA's 2005 – 2006 president, Patricia Todus, who continues to provide the rudder for sailing our membership successfully into the seas of information communication technology convergence.

Remarks made by ACUTA President Corinne Hoch at the presentation of the award at the Annual Banquet, April 21, 2009.

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Pat Todus accepted the award from Corinne Hoch, ACUTA 2008-09 President, at the Annual Banquet in April 2009.

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Continued from page 40

entire workforce to think shred, encrypt, protect, and lock up!

ACUTA: What is the impact of this issue for your campus?

Czerniak: Besides having to divert good money to security and training, there are many hurt feelings and issues that have to be dealt with, and these cause productivity problems. Most problems are caused by individuals making a mistake, throwing a report that should have been shredded into the garbage, or sending confidential information to the wrong address. When it comes out, the people who caused the problem feel very guilty and don't know what to do.

ACUTA: What is your strategy for addressing this issue?

Czerniak: We have diverted funds to create a security office along with updating our policies, providing training, performing internal audits, and then providing more training and more internal audits.

ACUTA: Given that a key function of the CIO's responsibility is preparing the campus to support future technologies, what technology changes do you see for your campus as you look forward five to seven years?

Czerniak: One of the ways to protect data is to move it to the central core and build walls around it. At the same time we continue to need to share more of the data we have collected with more people in more ways. Call it cloud computing, virtual servers and virtual storage, or any new acronym you have heard recently, but this will help in so many ways. Reducing the number of physical data servers and consolidating into two separate but connected facilities will improve security and reduce costs. At the same time we will be able to provide redundancy, reliability, and response time in a more timely fashion.

ACUTA: How are you readying the campus for these changes?

Czerniak: There have always been two primary ways to move users to a new thing, often referred to as the carrot-and-stick approach. I have always preferred the carrot. If we build our virtual server farms to be better and cost less, clearly the continuing budget constraints on all our colleges will push them to use these new services. As we build our new environment, we are working with each of our colleges to participate with the implementation so the service will meet their needs and cost constraints. They are partners in the process, so they have something to gain from participating.

Thanks to Wally Czerniak for sharing this information from Northern Illinois University. Reach Wally at wczerniak@niu.edu.

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Q & A with the CIO

WALTER L. CZERNIAK
NORTHERN ILLINOIS UNIVERSITY
ASSOCIATE VICE PRESIDENT
INFORMATION TECHNOLOGY

ACUTA: Much of the technology we now support in higher education is driven by consumer electronics. What decisions about your technology infrastructure have been affected by this and how?

Czerniak: Clearly consumer electronics has impacted all universities. It started with music downloading to the iPods and other devices and quickly followed up with cell phones and HDTV. It was not good enough to build our data networks to handle music or even standard-definition television. We had to build it strong enough for HDTV. With cell phones we basically had to rip out our old analog digital phone systems and replace them with DAS systems to be able to provide coverage for the multiple cell phone carriers that the students bring with them to campus. And of course we are continually updating and expanding our WiFi coverage on campus as it is so not hip to plug in a device. We are in the process of adding HD converters to provide this service to our students living on campus.

ACUTA: Freshmen at most institutions today are far more extensive users of technology than those of even five years ago. What is the most challenging technical aspect this presents for your campus?

Czerniak: Most of the problems were in changing the infrastructure to support the technologies mentioned in the previous question. More importantly, their desire to have everything online and accessible anytime, anywhere with any device has caused us to put more information online. Trying to make this data accessible by every device they bring to campus is challenging.

ACUTA: In what ways has this affected how you deliver support services?

Czerniak: In the past our support was mostly for students and involved a significant amount of hands-on with the students. They are needing less and less support, and they are placing higher demands on the university supporting the latest products and software. We are actually providing less support to students and more to faculty.

ACUTA: Since higher education seems to be perpetually in challenging budget times, what is your most important financial issue? How are you addressing it on your campus?

Czerniak: Funding of business continuity, security, and WiFi is our most significant problem along with demands from our faculty to lower the cost of services we provide to campus. It seems like we are in a perpetual state of budget reductions and users want their fees reduced. We continue to have to automate more services and reduce and eliminate many of our older services that are not used as much, but that only gets us so far. We have made a major effort to obtain more federal grants and add new customers. The more customers we serve, the lower our cost per customer, and the more subsidies (grants) we can obtain, the more we can lower our costs. By new customers I mean adding school districts, community colleges, cities, and medical facilities.

ACUTA: Aside from funding, what issue are you, as the CIO, currently spending most of your time addressing?

Czerniak: Security and business continuity are taking up a significant amount of time and funding. Changing the habits and work attitudes at a major, comprehensive university is like trying to stop and turn an aircraft carrier on a dime. We spent almost all of our historical lives being open and sharing. Trying to turn into a corporate security operation is extremely difficult at best. It is not just about writing a policy and performing an audit or two. You need to change the hearts and minds of your

continued on page 39

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